

CLAIMS

What is claimed is:

1. A method for preventing to form a spacer undercut in SEG Pre-clean process, comprising:

providing a semiconductor substrate;

forming a gate structure on said semiconductor substrate;

forming a spacer of double-film structure on a side-wall of said gate structure, wherein said spacer of double-film structure comprises a first spacer and a second spacer, said first spacer being formed between said side-wall of said gate structure and said second spacer;

removing a portion of a surface of said semiconductor substrate; and

etching said first spacer and said second spacer, wherein an etching rate of said second spacer is faster than an etching rate of said first spacer.

2. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 1, wherein removing said portion of said surface of said semiconductor substrate comprises a DHF (hydrofluoric acid diluted in deionized water) solution is utilized to remove a native oxide layer on said surface of said semiconductor substrate.

3. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 2, wherein a volume ratio for hydrofluoric acid to deionized water is about 1:10- 1:100 in said DHF solution.

4. The method for preventing to form a spacer undercut in SEG Pre-clean

process according to claim 2, wherein etching said first spacer and said second spacer comprises a HFEG (HF diluted by ethylene glycol) solution is utilized.

5. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 4, wherein a volume ratio for hydrofluoric acid to ethylene glycol is 0-4% in said HFEG solution.

6. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 4, comprising to remove said native oxide layer on said surface of said semiconductor substrate by said HFEG solution.

7. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 5, comprising to remove said native oxide layer on said surface of said semiconductor substrate by said HFEG solution.

8. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 1, wherein said first spacer comprises silicon dioxide.

9. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 8, wherein said second spacer comprises silicon nitride.

10. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 9, wherein removing said portion of said surface on said semiconductor substrate comprises a DHF solution is utilized to remove a

native oxide layer on said surface of said semiconductor substrate.

11. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 10, wherein a volume ratio for hydrofluoric acid to deionized water is about 1:10- 1:100 in said DHF solution.

12 .The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 10, wherein etching said first spacer and said second spacer comprises a HFEG (HF diluted by ethylene glycol) solution is utilized.

13. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 12, wherein a volume ratio for hydrofluoric acid to ethylene glycol is 0-4% in said HFEG solution.

14. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 12, comprising to remove said native oxide layer on said surface of said semiconductor substrate by said HFEG solution.

15. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 9, wherein etching said first spacer and said second spacer comprises a HFEG solution is utilized.

16. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 15, wherein a volume ratio for hydrofluoric acid to ethylene glycol is 0-4% in said HFEG solution.

17. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 9, comprising a native oxide layer on said surface of said semiconductor substrate is removed by said HFEG solution.

18. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 1, further comprising a raised source/drain is formed on said surface of said semiconductor substrate after etching said first spacer and said second spacer.

19. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 18, wherein formation of said raised source/drain is formed by selective epitaxial growth (SEG) method.

20. A method for preventing to form a spacer undercut in SEG Pre-clean process, comprising:

- providing a semiconductor substrate;

- forming a gate structure on said semiconductor substrate, wherein said gate structure comprises a gate oxide and a polysilicon gate electrode, said polysilicon gate electrode on said gate oxide;

- forming a first spacer comprises silicon dioxide on a side-wall of said polysilicon gate electrode and said gate oxide;

- forming a second spacer comprises silicon nitride on a side-wall of said first spacer;

- performing a first Pre-clean process, using a DHF solution to clean a surface of said semiconductor substrate;

performing a second Pre-clean process, using a HFEG solution to clean a portion of said surface of said semiconductor substrate and a portion of said first spacer and a portion of said second spacer ; and

forming a raised source/drain on said surface of said semiconductor substrate.

21. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 20, wherein a volume ratio for hydrofluoric acid to deionized water is about 1:10-1:100 in said DHF solution.

22. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 20, wherein a volume ratio for hydrofluoric acid to ethylene glycol is 0-4% in said HFEG solution.

23. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 20, wherein said raised source/drain is formed by selective epitaxial growth (SEG) method.

24. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 23, wherein said selective epitaxial growth (SEG) method for said raised source/drain is selected from a group consisting of low pressure chemical vapor deposition and ultra-high vacuum chemical vapor deposition.

25. The method for preventing to form a spacer undercut in SEG Pre-clean process according to claim 23, wherein said raised source/drain comprises

epitaxial silicon.